Catalogue no. 11-626-X — No. 006
ISSN 1927-503X
ISBN 978-1-100-20494-9

Analytical Paper

Economic Insights

The Role of Natural Resources in Real Income Growth in Canada, 1870 to 2010

by John Baldwin and Ryan Macdonald
Economic Analysis Division

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The following symbols are used in Statistics Canada publications:

.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0[s]	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p	preliminary
r	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

The Role of Natural Resources in Real Income Growth in Canada, 1870 to 2010

By John Baldwin and Ryan Macdonald

This article in the *Economic Insights* series is based on the research paper *Natural Resources, the Terms of Trade, and Real Income Growth in Canada: 1870 to 2010*. The research paper examines the importance of resource products in Canada's trade and real income growth.

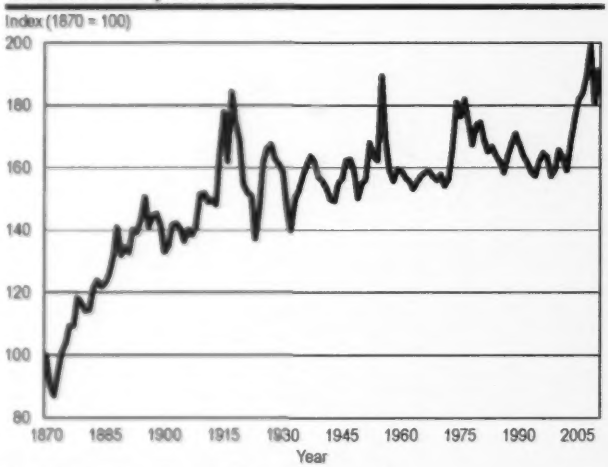
Beginning in 2007, Statistics Canada published a series of research papers examining how movements in natural-resource prices and the terms of trade affect real income growth and real expenditures.[1] The research papers looked at how the real income measures in the *1997 System of National Accounts* could be used to combine information on the terms of trade with measures of real gross domestic product (GDP).[2] The measure of real income examined is referred to as 'real gross national income' (GNI).[3] Real GDP and real GNI differ in that real GDP is a measure of production, while real GNI is a measure of the purchasing power of the income that accrues to Canadians through the production process, regardless of where that production occurs.

The research showed that there are periods of time when real GDP and real GNI present a markedly different picture of economic growth. For example, between 2002 and 2007, real GNI per capita in Canada grew an average of 3.1% per year, nearly double the 1.6% annual growth in GDP per capita over this period.

The largest source of differences between real GDP and real GNI is changes in the terms of trade—the ratio of export prices to import prices. Terms-of-trade increases allow a nation to raise its living standards by transforming a given stream of exports into a larger stream of imports.

The research also showed that the improvement in Canada's terms of trade in the period from 2000 to 2010 was largely the result of changes in resource prices. Examining the modern set of National Accounts showed that, since 1961, the terms of trade had cycled with resource prices. What remained uncertain was whether or not resource-driven changes in the terms of trade produced a permanent increase in real income. Because resource prices are volatile and undergo cycles, it may be that

Chart 1
Terms of trade, 1870 to 2010



Note: GNI: gross national income, GDP: gross domestic product.
Source: Authors' calculations, Statistics Canada.

1. See Macdonald (2007a, 2007b) Macdonald (2008a, 2008b, 2008c), Baldwin and Macdonald (2009), Macdonald (2010), and Macdonald (2011).
2. Three adjustments are made: one for the terms of trade, one for the relative price of tradables to non-tradables, and one for international income remuneration. For Canada, the most important changes relate to the terms of trade, and differences between real GDP and real GNI are dominated by terms-of-trade movements. For this reason, the terms of trade are discussed in detail here. The paper explores the other measures in detail.
3. Different geographical regions place different restrictions on the real income measures that can be analyzed. The only data available from the provinces for international and inter-provincial transactions relate to trade flows. As a result, a real income metric referred to as 'real GDI' is employed in the provincial papers and in some of the international studies in order to expand the sample size.

increases in one period are subsequently reversed. This appeared to be the case between 1961 and 2000, particularly around the oil shocks of the 1970s.

A long-run index of the terms of trade

Investigating whether increases in the terms of trade tend to be only temporary requires the use of a longer span of data. The size of the cycles in the terms of trade makes it difficult to empirically gauge whether or not a trend is present, even over a period as long as 1961 to 2010. To address the degree to which movements in the terms of trade lead to transitory, as opposed to permanent, changes in real GNI in Canada, historical and modern sources were used to create estimates of real GDP per capita, real GNI per capita, and the terms of trade for the period from 1870 to 2010.

The long-run index of the terms of trade is plotted in Chart 1. While there have been a number of cycles in the terms of trade over the course of a century and a half, there has also been a long-run upward trend. This feature of the terms of trade becomes clear with the expanded period but is difficult to discern between 1961 and 2010 given the size of the terms-of-trade changes during the oil shocks of the 1970s and in the period following 2000.

The post-2000 period experienced a rapid increase in the terms of trade, as did many earlier periods—the period from 1870 to the turn of the 20th century, the First World War, the late 1920s, the period following the Second World War, and the 1970s after the first oil price shock initiated by the Organization of Petroleum Exporting Countries. More importantly, while peaks in the terms of trade are followed by pullbacks, there has been a steady increase in the overall terms of trade through time. As of 2010, the terms of trade in Canada had increased by 91% since 1870.

Significantly, the period from 1870 to 2010 covers the development of many of the resource products important to Canadian export flows and, hence, to Canada's terms of trade. The successive development of these resources—from agricultural and animal products, to forestry (in the way of logs, timber, lumber, and pulp and paper), to metals (zinc, copper, lead, nickel, gold, iron ore, uranium), to oil and natural gas, to electricity, and to diamonds—fuelled economic development. Through the course of its history, Canada has moved progressively to more complex and more technologically advanced extraction processes that have allowed for the extraction and use of an increasingly wide variety of resource products. Over the period from 1870 to 2010, as the relative price of a particular product or product group began to be eclipsed by other resource products, Canada moved to extracting new resources with more favourable relative prices. This movement between product groups supported the overall increase in the terms of trade.

Real GDP per capita versus real GNI per capita, 1870 to 2010

The most commonly used metric for examining advances in long-run economic development is real GDP per capita. Real GDP per capita provides an indication of how production is increasing relative to the population of a nation. While it is a useful metric, it is not as comprehensive a measure for assessing changes in living standards as a metric that captures how much an economy is capable of absorbing. The terms of trade play an important role in real income growth since improvements in the terms of trade allow nations to expand their consumption and investment at a more rapid pace than they otherwise could. The more rapid expansion of consumption and investment occurs because imports become relatively less expensive or because the real stream of exports required to pay for past capital inflows decreases. In either case, improving terms of trade acts like a tailwind for changes in consumption and investment, while deteriorating terms of trade act like a headwind. These effects are included in the measure of real GNI per capita.

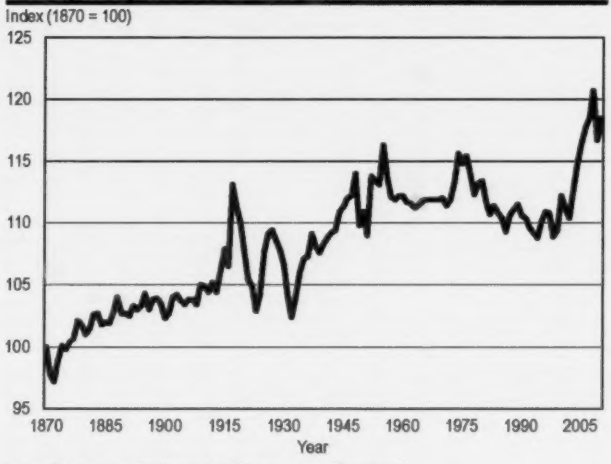
The long-run improvement in Canada's terms of trade between 1870 and 2010 produced a divergence of 0.12 percentage points per annum on average between real GDP per capita growth and real GNI per capita growth. The difference is not constant across decades but is generally positive. The decades between 1870 and 1919 tend to exhibit larger gaps. This period corresponds to the wheat boom and the beginnings of extensive Prairie settlement. During the 1920s, real GDP per capita growth rates and real GNI per capita growth rates are nearly identical. During the 1930s, a gap of 0.1 percentage points emerges, which is large enough to move the 1930s from a decade of decline to a decade of growth for Canada. After the Second World War, real GNI per capita again progresses more rapidly than real GDP per capita until the 1960s. The 1960s mark the first decade when real GDP per capita progresses more rapidly than real GNI per capita. While the growth rates of the 1970s revert to the historical pattern of higher real GNI per capita growth, the 1980s and 1990s have higher real GDP per capita growth rates than real GNI per capita growth rates. The 2000s reverse the pattern of the 1980s and 1990s and produce the largest gap on record between real GDP per capita growth and real GNI per capita growth—0.55 percentage points per year on average.

The long-run perspective

The long-run difference of 0.12 percentage points between real GDP per capita growth and real GNI per capita growth has a significant cumulative effect. Compounded over 140 years, it leads to cumulative growth in real GNI that is 18% larger than the cumulative growth in real GDP (Chart 2). Favourable increases in the terms of trade over the post-1870 period generated an increase in the volume of goods and services that Canadians can consume and in which they can invest that is 18% greater than the increase in production recorded over the period.

The 18% gain reflects a permanence in real-GNI growth over-and-above the growth stemming from increased use of economic inputs (capital and labour) and increased productivity. The construction of the long-run real GDP, real GNI, and terms-of-trade estimates succinctly shows that resource-driven terms-of-trade changes had a positive, long-term influence on Canada's standard of living.

Chart 2
Cumulative gain in real GNI per capita relative to real GDP per capita, 1870 to 2010



Note: GNI: gross national income; GDP: gross domestic product.
Source: Authors' calculations, Statistics Canada.

References

This *Economic Insights* article is based on Economic Analysis Division research on economic growth. For more information, please see:

Baldwin, J., and R. Macdonald. 2012. *Natural Resources, the Terms of Trade, and Real Income Growth in Canada: 1870 to 2010.* Statistics Canada Catalogue no. 11F0027M. Ottawa, Ontario. Economic Analysis Research Paper Series. No. 79.

Baldwin, J., and R. Macdonald. 2009. *PPPs: Purchasing Power or Producing Power Parities.* Statistics Canada Catalogue no. 11F0027M. Ottawa, Ontario. Economic Analysis Research Paper Series. No. 58.

Macdonald, R. 2007a. *Real GDP and the Purchasing Power of Provincial Income.* Statistics Canada Catalogue no. 11F0027M. Ottawa, Ontario. Economic Analysis Research Paper Series. No. 46.

Macdonald, R. 2007b. *Canadian and U.S. Real Income Growth Pre and Post 2000: A Reversal of Fortunes.* Statistics Canada Catalogue no. 11F0027M. Ottawa, Ontario. Economic Analysis Research Paper Series. No. 48.

Macdonald, R. 2008a. "The Terms of Trade and Domestic Spending." *Canadian Economic Observer.* Vol. 21. No. 1. Statistics Canada Catalogue no. 11-010-XPB. p. 3.1–3.10.

Macdonald, R. 2008b. *The Resource Boom: Impacts on Provincial Purchasing Power.* Statistics Canada Catalogue no. 11-624-M. Ottawa, Ontario. Insights on the Canadian Economy. No. 21.

Macdonald, R. 2008c. "The terms of trade in central Canada." *Canadian Economic Observer.* Vol. 21. No. 12. Statistics Canada Catalogue no. 11-010-XPB. p. 3.1–3.11.

Macdonald, R. 2010. "Real gross domestic income, relative prices and economic performance across the OECD." *Review of Income and Wealth.* Vol. 56. No. 3. p. 498–518.

Macdonald, R. 2011. *Measurement of Real Income in the System of National Accounts: An Application to North American Economies.* Statistics Canada Catalogue no. 11F0027M. Ottawa, Ontario. Economic Analysis Research Paper Series. No. 68.